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Stimulating Agricultural Growth and Rural Development in Sub-Saharan Africa

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Restoring agricultural growth in Africa will require new production technologies appropriate for different farming systems. It will also require eliminating government policies that discriminate against farmers.

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Economic growth in Sub-Saharan Africa depends on reversing the region's deterioration in agricultural performance — a reversal that is crucial both for meeting domestic consumption needs and for generating foreign exchange earnings through exports. But efforts to restore agricultural growth are hampered by the ecology of the region, undermined by policies that jeopardize agricultural and rural development, and complicated by sluggish global economic growth as well as agricultural policies in industrial countries.

Given the region's necessary transition from a land-extensive to a land-intensive farming system, attempts to improve agricultural production and to lay the groundwork for sustained rural development will depend on the correct choice of policies. In making these choices, policymakers must consider some important changes in African agriculture:

- Changes in farming systems — from slash-and-burn to multiple-cropping,
- Changes in land rights — from collective ownership to contractual arrangements,

- Changes in institutions — as more formal credit and marketing services become available.

Equally crucial to Africa's agricultural development will be parallel efforts to remove policy barriers that have undercut agricultural production or hurt agricultural productivity. These barriers include high taxes, price controls, unfavorable exchange rates, and inefficient parastatal marketing boards.

In addition to policy reform, long-term improvement in African agriculture will require developing and extending new production technologies. It will also require creating institutional structures to strengthen national research capabilities, and designing policies and investment strategies to improve the links between the farm and nonfarm sectors in rural areas.

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Sub-Saharan Africa

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I. INTRODUCTION

1. The economic future of a large part of Africa hinges on the growth of its agricultural sector. This dependency will continue as long as a sizeable portion of the work force depends for its livelihood on agriculture, a substantial part of consumers' expenditure is accounted for by food and other agricultural products, agricultural surpluses remain critical for domestic resource mobilization and the bulk of foreign exchange resources are provided by agricultural exports. In the present context, economic growth or economic regression in the countries of Sub-Saharan Africa (SSA) cannot be divorced from the performance of their agricultural sector. The situation will undoubtedly change over a period of time once non-agricultural activities gain in importance. Countries in SSA still have a long way to go before reaching that stage.

2. The fundamental constraints to economic growth in SSA are ones for which there are few short-term solutions. In most countries there is

^{1/} This report basically summarises six background papers commissioned by the Agriculture and Rural Development Department of the World Bank as a part of its contribution to the forthcoming Africa Report. The titles of the background papers and the names of the authors are provided in Appendix I. There are some aspects where the report differs from the conclusions arrived at by the authors of the background papers.

minimal physical infrastructure. Human and institutional resources necessary for the varied and complex tasks of modern economic management remain largely underdeveloped. Rapid population growth places severe constraints on economic development in some SSA countries while, at the same time, the natural resource base to support increased population deteriorates.

3. The above illustrative problems require long-term strategic investments that will come to fruition only decades from now. Yet precisely because they are long-term problems, it is essential to begin sorting out priorities and to planning an appropriate sequence of investment and policy interventions that can create the conditions for sustainable economic growth within specific country contexts. With the exception of a few countries facing extremely unfavorable physical and climatic conditions, rehabilitation of the agricultural sector through policy reforms can provide the necessary conditions for short-term growth in agricultural production. But sustainable growth in agriculture even in more favourably placed countries depends on medium- to long-term measures - on building an inventory of technology, on creating a growth-stimulating institutional environment, on developing capabilities to manage the complex tasks of agriculture and rural development.

4. A point that needs to be emphasized at the very outset when discussing agricultural development in SSA is the diversity within this region. This fact is sometimes overlooked; SSA is thought to be more homogeneous than it really is. The diversity across the continent expresses itself in terms of climate, soil, population density, culture and social behavior. This diversity exists both within countries, as well as between countries in the region. Because of this diversity, there can be

no uniform set of recommendations for stimulating agricultural growth.

Throughout this paper the emphasis will be on selecting the correct set of stimuli for the particular circumstances in a particular locality.

5. The second feature that needs to be taken into account in considering how to accelerate agricultural development is that SSA is in a state of rapid transition, transition in terms of demography, farming systems and economic institutions. Death rates are high but falling, while fertility rates remain high. Farming systems are moving from the earliest type that characterized this region for millenia, namely slash and burn farming, which still persists in some parts of Africa today. This system is giving way to a bush fallow system which in turn progresses to a grass fallow system. Finally, farming systems become based on annual and multiple cropping. These various stages of the development of farming systems are all in evidence in different parts of Africa. In the past, these systems evolved gradually over time, mainly in response to growing population pressure. During the coming years, changes in farming systems are likely to be accelerated all over Africa. This transition will have serious implications for technology, institutions, delivery systems and public policy.

6. Already institutions such as land rights are changing from collective ownership to household contract arrangements in some parts of the continent. More formal credit markets are appearing on the scene. Important changes in ownership and management of input delivery and trading systems are taking place.

7. It needs to be emphasized that in general SSA farmers have a small and poor land base. The constraints that they face are severe in large parts of the region. Some of these constraints are environmental and ecological. They need to be recognized and, to the extent possible, mitigated. But they cannot be removed. The most pernicious constraints affecting African farmers, however, are those imposed by human history and current policies. African farmers are discriminated against, taxed and unsupported. These constraints are capable of being removed. And once they are removed, agriculture in Africa will turn into a potential source of accelerated economic development.

II. PARAMETERS OF AGRICULTURE DEVELOPMENT IN AFRICA

(a) Environment and Ecological Constraints:

8. SSA is strongly affected by the rainfall regime of the Inter-Tropical Convergence Zone (ITCZ). Near the north and south latitudes of 30°, two high pressure zones of sinking dry air are warmed and dried by compression producing two major deserts, the Sahara and Kalahari. From these high pressure zones, the trade winds converge into an equatorial trough of low pressure with rising moist air. This trough is irregular and unstable causing major climatic fluctuations from droughts to floods. The seasonal and erratic effects of the ITCZ dominate SSA climate with the exception of a broad western coastal belt.

9. The potential for crop growth depends on the number of days during which rainfall and soil moisture combined can meet the evaporation demands of the local climate. Only 53 percent of Africa's land area is capable of sustained production of rainfed crops, of which over one-third can support short season crops only (i.e. crops with 75-180 days growing period). Even where rainfall totals appear adequate, the erratic distribution caused by the behaviour of the ITCZ is a serious constraint.^{2/} On the other hand, the temperature regimes are generally favourable to year-round cultivation where water is available.

10. The land area capable of sustained production is reduced further by the widespread poverty of the soils. When the constraint caused by shallow low-retention soils and heavy clays is taken into account, only 30 percent of the land area is either marginally or eminently suitable for cultivation. This amounts to 820 million hectares of which FAO estimates that 200-250 million hectares are currently under cultivation. There would appear to be, therefore, a reserve of 600 million hectares of unused land, although other constraints apply as will be discussed below. The most important feature, however, is its uneven distribution across the continent.

11. An FAO/IISA study describes six climatic zones. By applying these to the cultivable land areas in individual sub-regions, estimates of

^{2/} The ill-fated groundnuts scheme in Tanzania failed despite good average rainfall because the probability of a good growing season was below one in two.

carrying capacities can be obtained at various levels of agricultural development, latter understood in terms of input use and technology adoption. Many countries are still at a low input level (hand labor, without soil conservation, fertilizers, pesticides or improved crop varieties), while some areas of some countries have moved to an intermediate level characterized by the use of improved tools, draught implements, some use of fertilizers and pesticides with improved crop varieties and efforts to reduce soil erosion. Provided that governments grasp the seriousness of the situation and give high priority to agriculture and rural development, this intermediate standard can be achieved in much larger areas. The problems facing some ecological zones in Africa in the next quarter of a century are, nevertheless, stark. (See Table 1.)

12. The only major reserves of carrying capacity for human populations lie in the hot, humid rain forests of the Central Region and in the cereal-growing regions of the Southern Region. Three quarters of Sub-Saharan Africa's reserves of unused cultivable land are located in these two climatic regions. If the forest is cleared and, where required, modern engineering used to prevent the emergence of swamps, this area could become a vast food reservoir.

12. Countries in the Southern Region such as Angola and northern parts of Zambia and Tanzania are not overcrowded and can produce high yields of rainfed cereal crops. In the dryland Southern African region, the problem of agricultural development is essentially one of nutrient

TABLE 1: Capacity of Regions by Climatic Areas with Present Inputs

Persons/Ha	Desert	Arid	Semi Arid	Dry Subhumid	Moist Subhumid	Humid	Total Capacity at present land use	Present Population (1980 data)	Reserve Support Capacity
Growing Days	0	1-75	75-20	120-180	180-270	270+			
Cap. Persons/Ha	0.005	0.05	0.1	0.5	1.0	1.5			
Mediterranean & Arid North	1.0	2.0	1.7	6.0	15.6	0	rainfed 26.3 + irrigation 40.0	90 (grain imported)	- 24
Sudano Sahelian	1.3	14.7	8.4	8.9	7.9	3.6	44.8	55	- 10
Humid and Sub-Humid West	0	0	0.3	7.4	46.6	51.5	105.8	117	- 11
Humid Central	0	0	0	3.0	80.2	292.7	375.9	42	+ 334
Sub-Humid and Mountain East	0.1	3.1	3.2	4.4	21.2	15.5	47.5	81	- 33
Sub-Humid and Semi Arid South	0.2	4.2	8.9	21.8	91.9	6.9	133.9	62	+ 72
Totals	2.6	24.0	22.5	51.5	263.4	370.2	734.2	447	+ 328

Source: Calculated from FAO data. Quoted in "The Capacity of the African Environment to Sustain Population Growth" by H. Charles Pereira, p. 37 (mimeo).

supply. The humid Central African region presents some interesting prospects and some difficult problems. (See Table II).

14. The vast humid center of Africa is currently very sparsely populated area in which the land, from the point of view of a subsistence cultivator, is massively obstructed by heavy forests and which when cleared yields poorly due to the acidic, highly leached soils. Substantial investments in soil improvement, high levels of irrigation facilities and the building of a good road network are all essential preconditions for the development of this region. If development occurred, this one region could in theory provide the food for the whole of Africa's future population up to four times the present numbers. However, in addition to the very high costs of the massive infrastructure investment required, the ecology is unsuited for cereal production. The crops for which the region is particularly suited are roots and tubers. Unfortunately, the demand for these crops is limited and they do not travel well. There are possibilities for increasing demand for starchy staples and their ability to be transported should be capable of improvement. The most likely productive use for this region is the development of tree crops, some of which (e.g. oil palm) can also contribute to food supplies. But in general, these tree crops have to be judged on the basis of their export potential. At the moment, the area committed to tree crops in this region is very small. But even if the entire world's demand for these crops were to be produced in this region, much of the land would still require alternative farming systems.

TABLE II: Climatic Zones in FAO/IIASA (1986) Study

Climate Zone	Rainfall mm	Dry Seasons Months	Natural Vegetation	Land Use	Land Area M ha	% of Total	Problems
Desert	Less than 100	Over 10	Nil to sparse grasses, isolated shrubs	Nomadic grazing. No crops	825	29	Degradation by overgrazing and cutting
Arid	100 to 400	Over 9	Grasses and scattered trees in drainage areas	Nomadic grazing. No crops	486	17	Overgrazing Desertification Erratic water supply
Semi-Arid	400 to 600	8 to 9	Savanna and open woodlands	Grazing; precarious crops beans, millets, barley in north	233	8	Overgrazing Desertification Lack of Potable water
Dry Sub-Humid	600 to 1200	6	Woodlands (miombo) Tall Grass Savanna	Cereals, groundnuts mixed farming	314	11	Overgrazing Soil erosion Water supply
Moist Sub-Humid	1200 to 1500	4	Closed evergreen forest	Maize, cassava, bananas, yams, sugar	547	20	Tsetse, Tryps. River Blindness Poor shallow soils
Humid	Over 1500	-	Tropical rain forest	Tree crops. Palm oil, cocoa, rubber, bananas, cassava, rice	440	14	Leached, acid soils Low sun hours High humidity

Source: "The Capacity of the African Environment to Sustain
Population Growth" by H. Charles Pereira, p. 34 (mimeo).

15. If the existing tropical forest must give way to the development of agriculture, the countries should be made aware of the ecological damage which large scale destruction of rain forests may cause. More innovative ways would have to be thought of for the development of forests as part of the agricultural development of the region. Besides, using arable land in this region would involve massive population influx in this region from relatively overcrowded areas.

16. Development efforts for this region in the near future will need to be geared to the existing farming system. With existing low levels of population density, shifting cultivation will dominate for the foreseeable future. The adoption of improved technology would be limited to low-cost low-labor techniques such as the introduction of stress resistant varieties. Nevertheless, with all the constraints affecting most ecological regions of Africa, it is this region which, if immigration were encouraged offers the best chance of meeting the need to absorb the population excess from the regions that are unlikely to be able to support the projected numbers by the beginning of the next century.

17. The situation in the other regions is not so favourable. The Sub-Humid East cannot support an anticipated doubling of the population. Ethiopia today provides an example of the impact of a rising population coupled with land misuse. But even Kenya with its more advanced agricultural development requires use of marginal drylands that have no prospect of sustained production. Given current forecasts on technology,

investments, etc., it is unlikely that Kenya will be able to produce the food for more than one-half of its population by the end of the next 25 years.

18. The Sudano-Sahelian Zone cannot support a doubling of its present population at intermediate levels of agricultural development. Droughts and famines will become more likely as the fragile ecologies continue to degrade in these drylands. Finally, the Humid and Sub-Humid West could manage, with adequate organization and development, to achieve the level of production required to feed the predicted population of over 300 million by the year 2010. The Cote d'Ivoire offers an encouraging example in this regard.

19. Assuming political stability and civil peace, and this is a major assumption, three of the five Sub-Saharan Africa regions should reach 2010 without disaster. However, a single belt of food and land crises will extend from Somalia to Mauritania. In remote rural areas, with no support for input distribution, the exhaustion of soil nutrients already causes extreme poverty and inability to withstand droughts. Abandonment of worked-out soils and treks in search of food are prospects for the semi-arid belt from Mauritania to Somalia and for some areas of the southern drylands.

20. Against the background of the overall availability of croplands there are particular ecological constraints that apply in their utilization. Only the humid West and Central zones can rely on stable rain seasons. Moreover, in many marginal moisture areas, there is an absence of potable surface water or accessible ground water during the end months of each dry season. Where evaporation remains well above the rainfall supply the aquifers do not recharge to the extent required to maintain stream flow or sustain shallow water-tables required for hand-dug wells. Such lands are empty now because settlements cannot survive the dry seasons.

21. The trypanosomes which afflict livestock are carried by tsetse flies over an area of nearly 1100 million hectares which extensively overlaps the 820 million hectares of cultivable land. This is particularly a problem of marginal areas, less so in land containing more fertile soils because such land is attractive to settlers who clear the woodland so destroying the habitat of the flies. Major attempts to eliminate the tsetse fly by spraying with persistent insecticides are now being organized. Trapping of the flies, using chemical baits is a more promising method which avoids the environmental hazards of such sprays.

22. Lack of plant nutrients for continuous cropping is the next major constraint. It is as dominant and ubiquitous a problem for African crop production as overgrazing is for livestock production. These two constraints interact. The cultivators' traditional system of moving on

when the soil nutrients are depleted is being eliminated as spare land is taken up by population growth. The only input of plant nutrients is then manure from livestock. But when livestock numbers increase well beyond the carrying capacity of the rangeland, herbage is destroyed before it has developed sufficiently to extract useful amounts of nutrients from the soil. However, production from such rainfed croplands can be substantially improved by moderate levels of nutrient inputs. Compound fertilizers are one option, but a combination of leguminous crops, foliage of leguminous trees, manure and locally available rock phosphates would suffice in many areas if linked with other measures to prevent soil erosion.

23. Soil erosion and overgrazing are constraints that lead to desertification. No reliable data on the extent and rate of soil erosion in Africa exist, but it is estimated that by the turn of the century one-sixth of the cropland area will be destroyed. Although the technologies for soil conservation are known and demonstrated, the scale and effectiveness of their application in Africa can be summarized as widespread failure with but occasional successes. Soil erosion will be overcome only as part of a general improvement in agriculture development with a substantial increase in inputs and services.

24. The rapid destruction of Africa's forest resources in the sub-humid and drier areas is another major constraint on agricultural development. Forests have three essential roles, watershed protection, commercial timber production and the local supply of fuelwood and building poles. Protective forests on steep watersheds become critically important

as the lowland valleys become more populated. But in the sub-humid and arid areas which carry the greatest concentration of population, the destruction of the forest and woodlands has resulted in a severe shortage of fuelwood as well as reducing protective capability. Moreover, walking long distances for fuelwood gathering places severe demands on women's time and thus reduces the supply of agricultural labor at critical seasons. The planting of fast-growing trees is a partial answer, but to meet the demand for woodfuel by the year 2000 such programs would need to be increased by as much as 15 times the current level of 70,000 has. per annum.

25. Forestry departments are providing the technical guidance for campaigns of "Farm Forestry" or "Social Forestry" by which individual farmers plant trees on their own land, along roads and boundaries, and on steep areas. "Agroforestry", by which trees as a saleable crop are used as shade, shelter belts or for interplanting, is an important part of the solution. Such planting is critically dependent on water supplies by rainfall or irrigation, since it is essential to minimize competition with crops for both water and sunlight.

26. High value timber requires good land so would compete with demands on the land. But as a source of fuel, lower quality trees can be planted amongst crops without necessarily lowering crop yields if water is plentiful or the planting is properly managed so as to provide shade but not competition due to undue proximity to the crops. A more serious competition exists between fuelwood production on uncultivated land and the use of such land for grazing.

27. The uncontrolled expansion in livestock numbers referred to above is a major problem in its own right. A UN Environmental Program report (UNEP, 1984) estimates that overgrazing has seriously degraded nearly 600 million hectares of grazing land. Although better management and development of stock routes can improve the situation, the erratic fluctuations of the ITCZ will limit the extent of such development. No economic form of management can maintain stock numbers during severe and prolonged drought. Moreover, the conjunctive use of croplands and rangelands is severely constrained by the social attitude to rangeland as a communal "free good". This raises the issue of land tenure which is discussed later.

28. Inland waters which sustain some form of fishing total about 467,000 km², but supplies are unreliable since the surface areas fluctuate with the erratic rainfalls of the ITCZ. Lake Chad, for example, yielded 140,000 tons of fish in the 1973-76 but production now is negligible.

29. Marine fisheries is down played for West African countries and to a less degree East Africa (Mozambique, Madagascar, Somalia, etc.) although it is a very important element in the economy as well as in animal protein consumption. The total fish catch is less than 2 million tons per annum from marine sources and 1.5 million tons per annum from inland waters. The opportunity to increase these supplies depend on a major advance in the management of these resources. Rigid control on the mesh-size of nets, protection of shallow-water spawning sites and the use of insecticides to

reduce losses in drying and transport have proved effective in limited experiences and could assist in a major expansion of this food source.

30. Fish farming is an intensive and feasible means of producing large amounts of high quality food. To obtain high yields, it is necessary to enrich the waters with fertilizers and supplementary feed. Fish are the best converters of feed, and production/unit area is several times higher than cattle. Fish farming can contribute to a country's food needs by meeting the urban demand for high priced luxury foods. Integrated aqua/agriculture systems may also substantially add to rural income and nutrition. However, to make a significant contribution to food supplies improvements in fish breeding technology are awaited.

(b) Demographic and Social Factors ^{3/}

31. Population growth rates in the region are high and will remain so through the remainder of this century. Given that the total population will continue to grow at over 3 percent per annum (assuming major threats to life such as famine and disease are avoided) and that new entrants to the labor force for the next 15 years have already been born, the agricultural labor force will experience rapid growth in the coming decades. Population densities are however extremely variable both within individual countries and between regions across the continent. In the

^{3/} It is understood that these issues will be discussed in detail in a separate paper prepared for the Special Office on Africa. In this text we are highlighting some aspects relevant to agriculture and rural development.

humid central region where the greatest potential for rapid agricultural growth exists, population densities are so low that labor shortages and consequent high labor cost are major constraints to agricultural growth. In other areas, a large number of landless rural people results in such low labor costs that there is no incentive to move to high input advanced technology farming system. Migration within and across international boundaries is the logical answer in such a situation and, in the long term, migration is probably inevitable. But migration is impeded by political and ethnic considerations within a country and by the sensitivity involved in migration from one country to another.^{4/} Finding ways to facilitate migration must be one of the priorities to be addressed at the political level in the coming years.

32. Added to the pressures exerted by a very high rate of population growth is rapid growth of urbanisation. SSA has the highest rate of growth of urban population among all developing regions. There are two major implications of urbanization for the agricultural sector. First, the capacity to generate marketable surplus in agriculture has to be significantly augmented. Agriculture has to evolve rapidly from a subsistence phase to a commercial phase. Second, a change in crop mix becomes necessary. The growth of population in urban areas has dramatically increased the demand for cereals, in particular, wheat and

^{4/} Trans-border migration is next to impossible in many cases (Burkina Faso to Ghana/Cote d'Ivoire and Somalia to N.E. Kenya being exceptions) and often ends in massive expulsions (e.g. Nigeria to Ghana in 1984). Intra-national migration is frequently blocked by tribal rights or authorities (e.g. "empty" areas in the Gorgola basin in N.E. Nigeria).

rice. Imports of these two cereals now account for 60 percent of urban supplies. Food aid and food for work supplies are mainly wheat from high-latitude countries which only exacerbates the problem. If production of maize, millets and sorghum is to meet rising food needs, farmers must be able to secure a market which is in danger of being preempted by imports of other cereals. Similarly, expanding imports of milk and meat for urban supplies diminish the opportunity for expanding the domestic dairying and animal husbandry sector.

33. Another constraint requiring priority attention is that which affects the participation of women in rural activities, both farming and off-farm enterprises. Social and religious norms vary considerably from country to country and, in many, tightly restrict economic options available to women. This is most clearly the case in moslem countries, but even in non-moslem countries convention frequently limits women's participation to certain activities within the home requiring no capital inputs and using skills that they possess without enhancement by opportunities for education equal to that available to their male counterparts. Despite these cultural constraints to women's activities, many of the on-farm and off-farm activities in which the opportunity for growth is most evident are performed by unremunerated female labor. In order to facilitate their contribution to accelerated rural development there will have to be explicit recognition of their role and attention given to providing access to the services that they need. Few topics are more sensitive with African audiences than that of women's rights. The social ramification of removing existing discriminatory legislation will

have to be born by the African societies, and only they can make the necessary decisions. The international community, however, would be remiss in not alerting them to the very real efficiency costs that must be paid if women are not permitted to participate fully in rural economic growth.

(c) Farming Systems and Land Tenure

34. The earliest type of farming system, namely the "slash and burn" system still persists in parts of Africa after millenia. Although never the means of achieving a balance with nature as claimed by romantics, the slash and burn system is appropriate when population densities are very low, land is abundant and there is no access to markets. As population density increases, the forest degenerates into bush and bush fallow systems are introduced where patches of land are cultivated for longer periods before being left fallow. Weeding and tillage by hoe become major tasks. As population density rises further, a grass fallow system takes over with the fallow period reduced to as little as one year. The disappearance of woodland results in a reduction of the tsetse fly and keeping cattle becomes advantageous. Plowing also is adopted at this stage. A later stage involves annual and multiple cropping. Land becomes scarcer and consequently assumes a rising value and this is associated with higher returns to farming. Labor-saving devices are introduced and the use of modern inputs such as fertilizers becomes profitable.

35. Large areas of Africa have not yet reached this latter stage, while others are only now experiencing the transition to it. Still other

areas have been under annual cropping for some time. This diversity reflects the extreme differences in population densities across the length and breadth of the continent. In the earlier types of farming systems, input-intensive technologies are not attractive to farmers. Such technologies have a yield-increasing focus resulting in a reduction of the area needed to achieve a given level of subsistence output; but land is not the constraint. A reduction in the needed area will also reduce labor requirements, but as labor inputs in these systems are small the savings are correspondingly insignificant. Input intensive technologies become more cost-effective as farming systems become more intensive. Availability of inputs then becomes the critical issue. Annual cropping is not viable without replacement of nutrients. Exhaustion of plant nutrients from continuously cropped soils is the major cause of declining yields throughout the majority of SSA countries.

36. Farmers in Africa have shown a readiness to adapt their farming systems to accommodate new crops or higher quality varieties when marketing outlets are available. However, when land is abundant farmers will minimize the labor inputs in growing new crops or new varieties of traditional crops so that the quality of management and maintenance seems poor. As land becomes more valuable the quality of management and maintenance will improve and secure rights to land becomes a major concern to the operators.

37. Security of tenure is a major determinant of farmer response to development incentives and willingness to invest in land improvements.

Rapid change in current systems is both inevitable and necessary in Africa. What is more contentious is the debate as to how such change is to be brought about. One reason for this is the ideological commitment of many participating in the debate at national and international levels as to the respective merits of communal ownership and private property rights. This distinction is not, however, well founded in history.

38. Right to land combines a collection of distinct privileges such as right to use land, right to plant trees, right to inherit, sell or rent land, etc. While full private ownership encapsulates all these rights, most African tenure systems exhibit many different compositions of sub-sets of rights. Many nominally communal systems contain effective individual land rights. Lands around the village are frequently controlled by individuals while communal control is confined to peripheral lands. Even in the absence of an open market, a disguised land market often exists, particularly when population density is high and access to markets for farm products is good. On the other hand, so-called private ownership systems retain certain restrictions. In Kenya land sales must be approved by land boards and subdivision of land is prohibited.

39. In earlier times of land abundance, obtaining land was made possible either by establishing residence or claiming membership of a tribe or group through genealogies. The right to use land was usually heritable. Indigenous systems of land use easily accommodated concurrent and successive use of the same piece of land by different persons (e.g. by cultivators in one season and herders during the fallow period). Colonial

powers tended to deem unoccupied land as ownerless and vested in the colonial authority, thus shrinking the area available for cultivation and transhumance. Equally damaging was the concept of communal tenure to cover the occupied land. This meant that each member of a group had mere usufructuary rights with no power to sell or mortgage. This elevated the status of chiefs who were regarded as the land trustees, or led in some cases to chiefdoms being created for this purpose.

40. Land titling was a late-colonial and post-colonial innovation, although not universally adopted as an appropriate measure. In Tanzania, for instance, an attempt was made to improve the concept of communal tenure, but even here long-term leases are now being introduced. Kenya and the Cote d'Ivoire have most consistently pursued the rights to individual tenure - albeit with some restrictions.

41. The lack of legal right to sell land does not prevent de facto land dealings; nor does prohibition against mortgaging land totally preclude the use of land as collateral. Informal arrangements do have obvious limitations and foster corrupt practices. One important consequence of limited tenure systems is to reduce mobility of labor as some household members must remain on the land and cultivate it, however inefficiently, so as to avoid its possible loss.

42. There are very few studies which quantitatively examine the economic effect of secure ownership in SSA. But practice in other parts of the world supports the theory that secure ownership is a necessary

condition for investment in capital and land improvements, use of more intensive higher-cost practices and consequently higher outputs per unit of land.

43. A common misperception is that existing systems with a communal ownership basis are equitable, whereas freeing the land market increases inequality. Existing systems are not inherently equitable as the use of their power by chiefs bears ample testimony, as well as the more recent control over land exerted by groups in national power. Certainly these systems do not prevent the emergence of the landless. Nor does greater freedom of land sales necessarily increase inequality. An open and legal land market subject to certain checks and safeguards may be safer for the disadvantaged than the informal market that otherwise prevails. To this end, when individual ownership is formalized it is important that title be granted to all holders rather than issued on an applicant basis to those with the means and ability to take advantage of the opportunity. A system of title registration must also contain the capacity to continuously update the registers otherwise the system will be stultified.

III. ENLARGING THE ORBIT OF GROWTH

a) The Dimensions of Rural Poverty

44. There is an essential and basic human dimension to growth (i.e. to enlarge the groups who contribute to and benefit from growth). This becomes possible when households possess adequate human and/or material

assets to respond to stimuli provided by technological or policy induced changes. Households which do not have material or human resources remain at the periphery of growth and eventually aggravate the demand constraint. It is for this reason that a discussion of poverty is important for understanding processes and prospects of growth.

45. Poverty is an imprecise concept and difficult to measure, but whatever definition and standard is adopted, there is no dispute that there are great numbers of poor in Sub-Saharan Africa who are not able to secure the basic necessities of life. An understanding of the nature and extent of poverty in this region is an essential prerequisite to the design and implementation of strategies to alleviate the problem. The most salient feature of poverty distribution within countries of the region is its concentration in rural areas. Substantial rural-urban income gaps are documented in several studies. From the mid 1960s to the mid 1970s the average smallholder family in Tanzania had a standard of living of only just over one-half of the average urban wage earner family. During this period, the absolute income gap between the two groups became wider. A survey in Zambia in the 1970s found that ninety-five percent of rural households had incomes lower than the average income of urban workers.

46. In addition to the rural-urban spatial distribution of poverty, there are pockets of poverty within specific countries which derive from the physical isolation or ecological vulnerability of the region. Examples of such poverty pockets include northeastern Somalia, northwestern Mozambique, eastern Senegal, northern Niger and Mali and parts of Botswana.

47. While the wide-spread prevalence of poverty in SSA is generally acknowledged, there is less agreement on its quantitative dimensions due to the definitional problem and data deficiencies. Some international studies refer to poverty rates of well over fifty percent of the population which, given the income gap between rural and urban areas, would imply that the poverty prevalence rates for rural population would include the vast majority of rural dwellers. However, studies conducted in individual countries or regions within a country tend to produce estimates lower than these. Data from Kenya in rural surveys in the mid 1970s reveal that approximately forty percent of smallholder households are poor. Similarly, studies in countries such as Sierra Leone and Lesotho provide estimates of rural poverty prevalence in the forty to sixty percent range.

48. While large inequalities in income distributions between rural and urban areas are commonly recognized, it is often believed that the income distribution within rural areas is relatively equal. This belief is based on the assumption of land abundance, the ability of subsistence production using family labor to provide adequate food, and the role of traditional land tenure mechanisms in preventing landlessness. But this picture of the African country-side is no longer valid, if indeed it ever was. Recent studies provide evidence that there are significant inequalities in income distribution within rural areas and that these inequalities have sharpened in recent years. The growing inequalities seem to be particularly marked in countries such as Botswana, Ivory Coast, Kenya, Malawi and Nigeria that have experienced relatively high agricultural growth rates. Other studies show inequalities declining over

time. A study of income distribution in Tanzania shows a markedly more equal distribution of rural income. However, it might be argued that this equality has been achieved by keeping the majority of the population at the same low level of income rather than improving the lot of the poorest through employment creation or productivity gains. The rural poor in Kenya may be lagging further behind the better-off, but they have achieved real gains in living standards in the last twenty years.

49. Most of the studies on the causes of rural poverty highlight the importance of asset ownership. Although land pressure is not yet common across the continent, in some countries growing population densities and consequent pressure on the land is leading to fragmentation of holdings and growing numbers of landless. In Kenya, for example, population pressure has been largely absorbed by rural to rural rather than by rural to urban migration. This rural migration has been to semi-arid regions where unstable and risky agriculture competes with and displaces pastoralists. Ownership of livestock is the other major asset that is correlated with rural wealth. Where land has little asset value and is not traded, livestock is commonly the single most important asset. In a study in Botswana, it was found that animal husbandry accounted for over one-half of the income of the wealthier rural households, whereas the poorest households received only six percent of their income from this source.

50. Physical isolation of a village or region can exacerbate rural poverty because access to health, education and other services is limited, input and marketing services are absent and there is a lack of available

consumer goods to provide an incentive for increased production. In addition, many of these isolated regions are semi-arid and drought prone so that high poverty prevalence rates are also influenced by the vulnerability of the inhabitants to the physical environment.

51. There is much debate over whether the presence of cash crop production worsens or alleviates rural poverty. Evidence is scanty and some of it is conflicting but in many African countries growth in export crop production and productivity gains have led to wide-spread increases in farm incomes. Such increases, however, do not inevitably lead to improvements in the nutritional status of the family, particularly the children. Off-farm employment opportunities are highly correlated with diminishing rural poverty and this factor will become increasingly important in countries where population pressure creates a growing number of landless.

(b) Approaches to Poverty Alleviation

52. As is now well known and widely accepted, investments in education and rural health programs contribute in important ways to increased well being of the rural population and to agricultural growth. But the inverse of this must be stressed; it is increases in productivity and in the economic base that make it possible to finance essential social services. In virtually all countries in SSA, as well as in other continents that have achieved impressive progress in agricultural development, technological change leading to increases in total factor

productivity (that is, output per unit of total inputs), has been the major source of growth of agricultural production. An emphasis on investments in agricultural research and the importance of fostering wide-spread technological progress is justified by historical evidence from such countries as Japan and the United States. Nevertheless, the diversity of conditions across the region makes the determination of the appropriate technology for the African context as a whole virtually impossible. It is thus not surprising that the frequent technological optimism regarding the ability to devise quickly technical packages for general application has rarely been justified.

53. It is of fundamental importance that individual countries pursue strategies to attain the multiple goals of agricultural and rural development. To do this, it is essential to consider three strategic issues: (i) attention needs to be given to structural reforms of the policy environment in order to make future policies more favorable to agricultural progress and to patterns of investment and technological change that are more labor intensive and capital saving than those favored by past policies; (ii) it is essential to consider the policies and programs that are critical to fostering broad-based small farm development strategies; and (iii) organizational issues need to be addressed as a basis for striking the right balance between public and private sector activities in order to maximize the relative advantage of each.

54. A feasible and sustainable approach to reducing poverty and inequality requires an increase in returns to unskilled labor. The fact

that some sixty to eighty percent of the total labor force in most African countries still depends on agriculture for income and employment means that opportunities for productive farm employment must be expanded. Appropriate macro-economic policies must foster the rapid growth of nonfarm employment as well. These production-oriented measures must proceed in parallel with limited consumption-oriented activities in which the priority requirements are education and well focused rural health programs. Other than emergency relief to deal with famine situations, attempts to satisfy a basic range of needs of poor rural households by direct delivery of food, goods and services are neither feasible nor desirable. Until financial and human resources have been enlarged considerably, publicly funded activities cannot and should not go beyond simple low-cost measures to improve the health and survival prospects of children and their mothers.

55. As stated earlier, the macro-economic policies generally pursued in Africa have adversely affected agriculture. But within agriculture, the net effect of government policies has been borne most heavily by the great majority of small farmers. Because of the predominately agrarian structure and rapid growth of the labor force, small farms generally have an economic advantage over large farms. Emphasis on a small farm development strategy does not, of course, rule out pursuing a combined small farm and large farm strategy. But even in land abundant countries such as Tanzania, there is still a trade-off between pursuing a strategy to promote rapid expansion of a large-scale mechanized sub-sector and successfully implementing a small farm strategy. This is because of the cash income or purchasing power constraint that characterizes the agricultural sector in a country where

the domestic commercial market is small relative to the large number of households.

56. A sub-sector of large farm units can to some extent escape that constraint, if it accounts for the bulk of commercial sales, but that means that the purchasing power constraint is intensified for the great majority of small farm households. Concentrating on a tiny minority of very large farms is economically inefficient. It encourages emphasis on technologies that do not fit the existing factor endowment and which are too capital and import intensive to be generalized. Nevertheless, going to the opposite extreme of concentrating on the smallest of the small or poorest of the poor is also likely to be economically inefficient. Resources invested in that way would generally yield low returns because the most marginal farm units have less capacity to seize new opportunities than the small but viable farmer who can be encouraged to expand to become a medium-sized farmer. The growth of a class of medium-sized moderately well-off farmers is to be encouraged particularly if they emerge from the smaller farming community, as opposed to absentee farmers working in urban areas who purchase medium-sized land holdings which they proceed to operate inefficiently.

57. In most African countries where nonfarm employment is still limited and the opportunity cost of labor is low, the economies of small farm size out-weigh the economies of scale. This is primarily because agricultural production is a biological process spread out in time and in space which gives rise to costly problems in recruiting and supervising a

large work force. Furthermore, decentralized decision making and the exercise of initiative and judgement is especially important in farming in Africa because of the unpredictable variations in weather and other exogenous sources of uncertainty. Because family members have a claim on the production of the farm rather than receiving a fixed wage they have strong incentives to work hard and exercise initiative and judgement. Finally, it needs to be stressed that a major advantage of pursuing a broad-based small farm development strategy is that it generates a pattern of growth of farm incomes and of effective demand for nonfarm goods and services that stimulates more rapid growth of output and employment than would be obtained from a large farm strategy.

58. There is little doubt that the failure to strike a proper balance between public and private sector activities has been a major factor responsible for unsatisfactory agricultural growth in Sub-Saharan Africa. There are four areas where government action needs to be strengthened in this regard. First, establishing post-secondary educational institutions to train agricultural scientists and agricultural administrators. Second, to strengthen national agricultural research systems and extension programs in order to generate and diffuse feasible and profitable innovations among the farm population. Third, to define investment priorities including road construction and other required elements of rural infrastructure. Four, to implement programs to improve maternal and child health and survival prospects.

59. Another area that requires priority attention is to develop policies and programs to effect the transition from the public sector to the private sector of the provision and distribution of farm inputs and for the marketing of agricultural products. The underlying logic is to strengthen government action in areas aimed at the provision of essential public goods that can be expected to have catalytic effects on development while reducing the use of scarce government resources for essentially commercial activities for which private firms have a comparative advantage.

60. Advocates of the basic needs approach argue that the required strategy of rural development is to concentrate upon the poorest rural groups (i.e. those who cannot afford or produce enough food or secure access to adequate health care and those least served by existing infrastructure and services). From a short-run humanitarian point of view there is clearly much to be said for putting the last first. Experience in SSA during the past two decades is, however, a powerful reminder of the importance of considering the feasibility, as well as the desirability, of alternative policies. Politicians and bureaucrats rarely are the ones to suffer hardship when imbalance between public sector responsibilities and the resources available gives rise to severe budget and foreign exchange crises and systemic failures in the implementation of the rural development programs. The polarization of the development debate into a misleading choice between growth or equity or between a basic needs as opposed to a trickle down development theory has undoubtedly contributed to the failure to give more vigorous support to a rational small farm development strategy capable of furthering both the growth and equity objectives of development.

VI. TECHNOLOGICAL INTERVENTIONS

61. As in other developing regions, technology will be the "engine of growth" in SSA. However it must be borne in mind that there is no one single answer for any individual issue that will be applicable across the whole of SSA. In certain areas of certain countries one of a whole range of conceivable interventions may be suitable. For example, high input, high technology farming has already been practiced in some areas, whereas slash and burn is still the farming system in others. Moreover, the situation in the region is not one of stagnation. In many places the farming systems are undergoing rapid change, farmers are responding to changing cost conditions by changing their farming practices. They are responding to changing land values by not only farming more marginal lands but by investing their own resources in the development of new lands and by changing the rules governing access to land. New crops have been readily adopted where market incentives were positive.

62. There is clearly no agro-climatic reasons for general pessimism either. The continent still has vast areas of high agro-climatic potential. The human resource base is rapidly increasing in size and its health and education improving. Many past failures occurred not because growth was not possible, but because many of the changes which focused on yield increase as a source of growth were incompatible with the low intensity farming system to which they were applied or recommended. However, as population densities increase in coming decades, many of the interventions that failed in the past will become more relevant and will be readily adopted. In the following paragraphs, need for proper targetting of input-intensive technology is emphasized and a few key problems related to technological transformation spelled out.

(a) Targetting Input-Intensive Technology

63. Attempts to introduce input intensive technology has not met with much success in SSA. These attempts failed because of a failure to take into account local resource endowments and farming systems. Farmers will only adopt new technologies and use new inputs if they reduce the unit cost of production [including the implicit cost of family labor and the opportunity cost of land]. The intensive use of inputs will reduce the unit cost of production in some conditions, but not in others.

64. In land abundant areas such input technologies are not generally attractive to farmers. The strategy implied in using these inputs is to increase yields per unit area, and hence reduce the area needed to produce a given level of output. When land is plentiful this strategy does not provide the farmer with any appreciable saving, since the opportunity cost of land is negligible.^{5/} By reducing the area needed to provide a given output, input intensive technologies also reduce the labor needed in land preparation, planting and weeding. But this saving in labor costs is usually less than the cash and labor costs required for incorporating these yield innovations into the system. Consider the profitability of using

^{5/} A look at Uganda research and extension efforts over fifty years, from 1910 illustrates this problem. A major research program in Uganda was directed at developing and promoting high-yielding varieties, in conjunction with the fertilizers, better crop husbandary, and improved land management. Farmers simply did not adopt most of the proposed innovations, on the other hand, they readily adopted new crops such as cotton by expanding their cultivated areas. Increase in population density will make land scarce and valuable so that research of the type pursued almost a century too early will become appropriate. Indeed, some of the earlier findings will still be valid.

chemical fertilizers. If labor is scarce and land abundant, a fallow farming system is a cost-effective way of maintaining soil fertility. In comparison, the switch to organic fertilizers is uneconomical since it involves more labor. Similarly, the switch to chemical fertilizers makes no sense either since it involves more cash expenditure. High-yielding varieties of grain often require high levels of chemical fertilizers and more sophisticated crop husbandry. Because of this, such varieties are generally not attractive to many small farmers in many parts of Africa. However, modern varieties which reduce drought hazard and have valuable resistance to disease, (e.g. short season maize), are accepted by the small producers, wherever soil climatic factors are favorable.

65. It is necessary, therefore, to understand that the aggressive promotion of input intensive technologies needs to be carefully targetted to the areas where the farming system has evolved to a point where these technologies will be adopted. Such areas, of course, do exist either as pockets within a country, or as whole regions of a country. When the fallow period becomes so short that soil fertility begins to decline, it becomes cost-effective to fertilize the soil. The first step is usually the use of organic manure, and at such a stage the intensity of farming may have increased sufficiently to make the use of draft animals economic. As land becomes relatively scarce and land saving technologies become more attractive, farmers can obtain additional land only by buying or renting good land or by developing marginal land. High-yielding technologies will be applicable in such circumstances as they reduce the cash or opportunity cost of this land.

66. As long as the conditions are appropriate, it is possible to accelerate the adoption of input intensive farming. Facilitating an early introduction can be achieved by ensuring (i) the supply of the inputs, (ii) the credit required to obtain them, (iii) reliable markets from which to obtain the inputs and to provide an outlet for the increased production, (iv) reliable access to spare parts and facilities for the machinery used, and (v) adequate information and extension advice. In areas where conditions are not yet right for switching to input intensive technology, the acceleration of agricultural development will require the promotion amongst small farmers of new crops, improved varieties of existing crops, and improved systems of animal husbandry.

67. The history of SSA shows very clearly that farmers are willing to switch from subsistence crops to cash crops when marketing outlets are available. Where infrastructure has been provided, even in thinly populated parts of SSA, farmers have readily switched to tree crops such as cocoa and oil palm with a minimum of labor input, so that the quality of management and maintenance seem very poor. But it is cost-effective to expand low-grade planting rather than improve the quality of the plantation, when land is abundant. As population density increases and the quality of infrastructure improves, it becomes cost-effective for farmers to improve the quality of their plantations.

68. Farmers are also willing to consider the adoption of higher quality varieties of their crops. For example, they will switch from short staple to long staple cotton when the higher price of latter compensates

for the greater labor and input costs involved. This type of shift in cultivation practice is independent of land value.

(b) Improvement of Traditional Systems

69. Large areas of Africa are still characterized by the various stages of the farming system evolution that involved the use of fallow. Some areas are in the transition period from the fallow systems to annual cropping. What can be done to accelerate this natural evolution given that population density for some time may not provide a sufficient spur? Probably the single most important stimulus that can be provided is to improve marketing outlets in such areas. Farmers in SSA have consistently shown that they are willing to move into the market economy when the markets and the infrastructure to reach the markets are available. If marketing of traditional or improved varieties of traditional crops proves profitable, this in itself induces population growth via immigration and helps to drive up land prices. This in turn accelerates the evolution of the farming systems to an intensive high input technology.

70. In areas of land abundance, stress avoiding varieties of crops have obvious attractions. They benefit farmers without requiring purchased inputs such as fertilizers and pesticides. They are also attractive in arid and semi-arid upland areas where the rate of return to fertilizer is sharply constrained by lack of soil moisture. Moreover, stress avoiding varieties do not usually increase labor requirements. The only cost involved is for new seeds and even that is often a one-shot cost since farmers can multiply such seeds locally.

71. Farmers are as eager to adopt stress resistant varieties in land scarce as in land abundant ones since the benefits are independent of land and labor costs. In land scarce areas, stress resistance reduces the risk of using high-cost inputs. In these environments, farmers would like to have the best of both worlds and obtain varieties which are simultaneously high-yielding and stress resistant. Indeed, the importance of resistance to pests and disease is increasing in large areas characterized by high-yields in monoculture, as such areas are more prone to attacks by pests and disease.

72. One of the most valuable efforts that can be made to facilitate the development in areas characterized by traditional farming systems is therefore to concentrate on research to improve stress resistance. The development of different kinds of stress resistant varieties based on the agro-climate and farming system of each area will have to be continued. Drought tolerance may be important in semi-arid areas, but would be pointless for crops grown in humid conditions. Pests and diseases vary in different areas so that research will have to be carefully targetted according to the particular circumstances. Breeding for stress-resistance has been a major activity of ICRISAT, ICARDA and IITA for more than ten years, with good success. So also has "hot spot" selection for local pest resistance.

73. Livestock are an important resource in SSA. Production of meat, milk and animal products amounts to about 20 percent of the GDP. Livestock are also valuable sources of organic fertilizer and draft power. Data on

livestock are poor, but it would seem that the rates of growth are below the rates of population increase. Milk production, for example, has increased by only 1.4 percent per annum since the 1970's. The livestock population is currently estimated at 150 million livestock units (70% cattle, 20% sheep and goats).

74. Nomadic and transhumant systems persist in arid and semi-arid zones and, provided herd sizes are controlled by the systems, are compatible with the environment. But these systems are under increasing pressure as crop production expands due to rising population densities. Future development options for nomadic populations are very limited. Conversion to a sedentary system seems inevitable or, alternatively, emigration to more humid zones where mixed farming may be possible if the tsetse fly can be controlled.

75. In principle, some technology for rangeland improvement exists, but its application is constrained by low benefit/cost ratios and an inability to control herd size. Ranching technology is feasible but the required management expertise is very high and so is not applicable without major changes in tenure systems and intensive management training. Group ranches have achieved some success in focussing inputs and veterinary services on members but have had a poor record in range management.

76. Increases in population density bring about closer integration of crop and livestock farming systems. Crop residues, rather than the natural range, emerge as the dominant source of fodder, with the cycle continued by

using the manure to fertilize the soil. At high population densities farmers incorporate both crops and livestock within their own holding, leading in turn to housing and stall feeding. Actions to improve agricultural production in densely populated areas should be geared primarily towards the crop sector for which technology is available and demand is likely. Even though little may be done for the livestock sector directly, it is nevertheless in such areas that the most growth in livestock production can be expected. Interventions aimed at improving such production should focus on the provision of veterinary services and improved feeding regimes by the use of mineral and high protein supplements or legume-based leys or fallows.

77. Attempts to manage the low grade pasture which would constitute the remaining common grazing areas would likely prove to be unsuccessful. These areas could be designated as private ranches or the land converted into forested areas. Such efforts, however, are likely to confront major resistance by the dryland populations.

78. The strategy for accelerating the introduction of input-intensive technology as well as facilitating improvements in traditional systems must focus on three main issues: needed improvement in research capacity; water availability; and access to greater power on farms. These are considered further in the following sections.

(c) Adaptive and Applied Research and Extension

79. Research for augmenting yields has to go through three stages:

(i) Basic research (basic knowledge on planting material, on pests and diseases, soil fertility characteristics, etc.); (ii) Adaptive research (adaptation of basic research to specific agro-ecological zones, cropping systems etc.), and (iii) Applied research (on-farm testing and evaluation of available technology). Notionally, there is a sequence in developing these capabilities. But in practice there can be overlap between various stages, particularly if the results of basic research done elsewhere can be borrowed. Scientists believe that, in general, basic research relevant to farming systems in SSA exists. A few scientists working in Africa do not share this view; they maintain that the national research institutions are extremely weak and this manifests in little basic research of any substance. However, they have probably not looked into the possibility of transferring basic scientific knowledge. It is at the level of adaptive and applied research that major gaps are encountered. At both of these levels, a closer acquaintance with the relevant farming environment is essential.

80. Governments in SSA have made inadequate long-term investments in agricultural research in recent years, partly because of more pressing demands on limited budget resources and partly because there are few examples in SSA countries of effective research systems yielding high social or private returns. The absence of domestic efforts were not compensated by foreign interest in development of viable research systems. It was unfortunate that the upsurge in external assistance in the 1970s

coincided with a shift in donor priorities away from long-term investments in institution building. This period was marked by optimism about the direct transfer of existing technologies to developing countries. Much of the limited funding for research was used in a piecemeal fashion attached to individual area development projects. In the absence of adaptive and applied research, such efforts not only failed to produce profitable technological packages, but had adverse effects on the development of national research systems.

81. More recently, interest has grown in the development and improvement of national extension systems for communicating information to farmers. It is all the more important, therefore, that urgent attention now be given to financing the development of a sound research capacity at the national level in the countries of the region. The approach should be an integrated one, with experimental research activities, applied farm systems studies, and extension services closely interrelated.

82. International research centers will continue to play an important role in furthering our knowledge on basic and applied research. Adaptive research, however, remains the crux of the problem and requires a strong management and organizational capability at the national level. Adaptive research will be successful to the extent farm level problems are identified and given priority in setting the research agenda. There is a

strong need to improve the quality of national researchers.^{6/} Countries cannot rely in the long-term on expatriate consultants. Where civil service regulations prevent the attraction and retention of the right calibre of staff required by national research organizations, special incentive procedures will be required. Adequate funding is also a necessary condition. Additionally, it is better to reduce the breadth of the research program and to concentrate on only a few agreed priorities so that sufficient resources be devoted on a recurrent basis.

83. As a part of a research strategy it is important to be selective in the choice of area as well as research themes. Long before population growth makes land scarce throughout a country, some areas become densely populated because they are close to transport and marketing facilities or because of exceptional soil and climatic advantages. Initially, yield raising research and extension should be targetted on such areas. Later, as land scarcity becomes a more general problem, research work will need to meet the needs of the larger parts of the country as a whole. Importantly, a good research capacity will have already been established because of the selective focus and concentration of previous efforts.

^{6/} Mention may be made of a recent initiative in this direction. The World Bank and other agencies have launched a Special Programs for African Research (SPAAR). The work program of SPAAR is directed to fulfill three inter-related objectives: (a) to strengthen the research capacities of existing African agricultural research systems; (b) to increase the effectiveness of funds contributed by donors, through improving cooperation; and (c) to organize new long-term funding for African countries in line with their priorities.

(d) The Role of Irrigation

84. It is important to distinguish between an assured supply of water, which basically entails proper water management, from the narrow definition of irrigation. One of the lessons taught by the experience of agricultural development in Asia is that an assured supply of water is necessary to use full complements of modern inputs. Note, however, that the emphasis is on assured water supply, and not necessarily on large-scale flow irrigation. The record of the latter in SSA is highly discouraging. The role of irrigation (narrowly interpreted) depends on two important factors: the irrigation potential and the cost per unit of irrigated area. On both those counts SSA countries are at a disadvantage.

85. FAO has estimated the irrigation potential of SSA at 33.6 million hectares. Recent studies by the World Bank indicate that this may be an overestimate. In five detailed country studies, the total irrigation potential was estimated to be 20 percent smaller than the FAO estimate. Another factor that needs to be taken into account is that much of the land with irrigation potential lies in areas with sufficient rainfall to make the investment in irrigation unnecessary. A substantial part of 8 of the 10 countries with the largest areas with irrigation potential fall in this category. These countries are Angola, Zaire, Zambia, Mozambique, Tanzania, Nigeria, Central Africa Republic and Madagascar.

86. The revised estimate, allowing for the above adjustments, is that the potential for irrigation in SSA is in the range of 15-20 million

hectares of which 5 million hectares are already irrigated. This is an extremely small figure both in absolute terms and in relation to a contribution to the food needs of the population. However, there are 8 countries where although the areas involved are small the rainfall is insufficient to sustain production. The countries where irrigation can play an important role are Mauritania, Senegal, Mali, Burkina Faso, Niger, Somalia, Kenya and Botswana. Limited in area though it may be, irrigation will be an essential contributor to agricultural development in these countries although of little significance in an African regional context.

87. It is accepted wisdom that developing even the limited irrigation potential in Africa is a high cost proposition with figures quoted as high as US\$40,000/ha, several times the costs in other regions. This is largely due to the inclusion among irrigation costs of many components that are aimed at remedying a lack of supporting infrastructure which are not directly attributable to the irrigation scheme itself. Examples are roads, houses, and public services. Recent FAO estimates provide a range of irrigation development costs of US\$5,000 - 20,000/ha. An ongoing World Bank study would indicate that costs in the upper part of this range are rather exceptional. The use of realistic expectations of real exchange rates would lower the figure further to a range that is both plausible and viable to contemplate.

88. There is another cost to be paid in irrigation development namely environmental damage. As in any region there are the risks associated with water-logging, salinization, damage to fisheries and downstream water

supplies. There are two problems, however, that are particularly serious in Africa: development of water-borne disease and competition with floodplains.

89. Irrigation in Africa has led to large scale disease development, particularly schistosomiasis. Prevalence rates in some instances have risen from 10 percent before irrigation to 80 percent after (e.g. the Gezira scheme in the Sudan). Malaria is a second threat in terms of increased prevalence. On the positive side, the incidence of onchocerciasis (river blindness) is reduced with the expansion of irrigation.

90. In many river basins in Africa, large shallow plains provide a vital role in acting as seasonal floodplains. The most renowned of these is the Sudd - the largest swamp in the world - on the White Nile, but there are about 25 large swamps dispersed all over the region. They absorb huge amounts of water that could otherwise be utilized by irrigation, but they have hydrological (flood control), economic (fish, livestock and rice production), social and ecological significance. Millions of people obtain their livelihood using these swamps and certain wild life, particularly migratory birds, are dependent on them. Moreover, water development upstream (e.g. the Inner Delta of the Niger) or downstream (e.g. the Jonghei Canal on the Nile) reduce the amount of water available to/in the floodplains, swamps, lakes and other wetlands, and thus reduce their area and productivity.

91. The scope for irrigation seems limited and cost - even when calculated on a conservative basis - rather prohibitive because irrigation is generally understood in terms of large scale, flow irrigation projects. If irrigation is understood in its broader role of reducing moisture stress by managing water availability, a large number of options open up. These would include: (i) large-scale irrigation works involving construction of headworks and canals; (ii) small-scale irrigation works raised with local participation consisting of small bunds, excavation of tanks and earthen dams; (iii) lift irrigation through either stationary or mobile water pumps; (iv) recessional water management where water in swamps and low-lying areas are channeled and regulated to meet irrigation needs; and (v) harnessing subsoil water.

92. It is important to take a comprehensive view of the water resources of an area on the basis of a properly organized hydrological survey. A World Bank/UNDP effort is under way to map out scientifically the potential surface as well as ground water resources in some countries of SSA.

(e) Draft and Mechanical Power

93. One of the most serious shortages on African farms is that of draft energy. It will become a more serious constraint with the introduction of intensive agriculture. There is a mistaken and unfortunately widespread belief in Africa that solutions to the problem of energy shortage on farms lie in the increased use of tractors.

94. Because in many parts of the world tractors have been cost-effective where land is abundant and labor scarce, some experts expected them to be appropriate in Africa. With minor exception, such expectations proved ill-founded and resulted in some spectacular failures. The main reason is contained in the earlier discussion of the historical development of farming systems: labor saving tractors are not needed if labor inputs are themselves low.

95. The number and intensity of operations are too low in forest and bush fallow systems to justify plows. To use a plow effectively tree stumps must first be removed. This arduous task is not justified if plots are abandoned after a few seasons. It becomes worthwhile only when land becomes scarce and is used for long periods. When this condition is met, should farmers shift directly to tractor plowing rather than first adopting draft animals? And where draft power is well-established, should tractors replace it? The answer to these questions depends on savings in wages and animal costs, availability of economic credit, the relative costs of fodder and diesel and the reliability of servicing and spare parts facilities. In many parts of Africa the conclusion is that animal power still has the edge in its favour. Of 17 World Bank funded projects that attempted to pass directly from the hoe to the tractors, bypassing the draft animal stage, all but three failed. The only successes have been in valleys, alluvial plains and savannahs where there are heavy soils requiring high power levels to prepare, a scarcity of labor and no tree stumps. Sudan and Zimbabwe provide examples where these conditions were met, although even then subsidies for mechanization were substantial.

96. The prospects can be summarized as follows:

- mechanization of power-intensive operations such as milling, pumping and transport will spread and intensify throughout Africa;
- animal draft power will extend its use for permanent cultivation;
- replacement of animals by tractors will be limited to particular situations and locations.

97. Public policy should facilitate the process of mechanical adaption by providing a distortion-free environment giving farmers the maximum freedom of choice. Governments should refrain from subsidizing any particular form of mechanization.

V. ECONOMIC POLICY AND INSTITUTIONAL CHANGES

(a) The Policy Regime

98. At the start of the present decade, African governments and the international donor community became increasingly concerned over the trends and prospects for the economic growth in SSA. At the international level, the world recession was reducing demand and forcing down international prices for Africa's major exports. International terms of trade fell against agriculture. External resources were no longer freely available and debt servicing of past loans was placing a severe burden on foreign exchange balances. Protectionist trade measures and domestic farm policies which subsidized the agricultural sector in industrialized countries made it increasingly difficult for African exporters to compete on world

markets. These economic difficulties were compounded by adverse climatic conditions during the early 1980s which crippled agricultural output in most SSA countries.

99. In addition to these "exogenous" factors, problems within the control of African governments were also posing obstacles to economic growth in SSA. Macroeconomic and sector policies formulated and strengthened in the 1970s served as a means to transfer resources from tradeables in general and agriculture in specific to non-tradeables, primarily the urban based manufacturing sector. The disincentive effect of this urban bias in government policy became starkly evident in declining and in some cases negative growth rates in agricultural production by the late 1970s. High population growth rates quickly eroded even marginal gains in output. Finally, inefficient public sector management, particularly in the delivery of inputs and the marketing of outputs, highlighted the weaknesses in local institutions and hindered already poor economic growth.

100. In response to the deteriorating economic environment, the World Bank group began to advocate a common set of institutional and policy reforms among African countries. Programs of adjustment typically address, either directly or indirectly, four interrelated areas of reform:

- (a) reform of trade regimes through liberalization and measures to reduce distortions, thus increasing the competitiveness for exports, and promoting efficient resource allocation;

- (b) mobilization of domestic resources through fiscal and financial policies, particularly measures for rationalization of interest rates and tariffs;
- (c) improvements in the efficiency of domestic resource use, including rationalization of the public sector investment program and reductions in the level of government involvement in economic decisions, particularly regarding prices; and
- (d) institutional reform to divest parastatal organizations of the functions which private sector can perform more efficiently.

101. Because most of the serious efforts toward policy reform in Africa have been initiated only in the past five years, it is still too early to determine with any degree of certainty the benefits of these changes. However, experience from other developing regions indicates that positive results can be obtained from restructuring counter-productive economic policies in favor of a more efficient growth-oriented strategy. For example, the unexpected turn around in the agricultural performance of South Asia attests to the benefits to be derived from the transfer of technology and external resources combined with the implementation of important growth-oriented policies and programs.

102. Clearly, shifting the domestic terms of trade in favor of the agricultural sector and "getting the prices right" in general will bring about significant reallocations of resources. An economy characterized by a diversified agricultural sector consisting of highly substitutable annual crops will be able to undergo policy reform with relative ease and the production response will be relatively quick. In less flexible economies, the benefits of policy reform will not be as immediate. For example, getting the prices right might induce a shift of resources into tree crops which have a gestation period of up to five years. The major capital investments required to introduce these crops will not become productive for a number of years. Although a certain amount of intercropping of annual crops may be possible, policy makers will remain reluctant to commit resources to such crops when the adjustment period is so long, particularly when commodity markets are unstable.

103. This problem is not limited to tree crops. Many economies in SSA are characterized either by monocultures or a fairly restricted range of commodities. New activities will have to be introduced, a great deal of learning-by-doing will be required, and alternative complements of capital and institutional infrastructure may be needed. Moreover, a lack of locally adapted modern technology may weaken the output response.

104. External sources of concessional assistance can play an important role in supporting the introduction of new productive activities. But it is important that the physical and institutional constraints to policy reform be taken in account and that loan funds address specific adjustment

problems. In the case of the introduction of tree crops, sizeable commitments of capital may be required to bridge the production gap. More generally, intensive extension efforts may be needed to transmit available knowledge on new production alternatives, as well as an intensive program of on-the-farm trials and adaptive research to provide information necessary to facilitate this process. In many cases this should be treated as a classic adjustment problem in that it should aid in facilitating resource mobility.

The Income Redistribution Effects of Policy Reform

105. Most of the policy reforms currently being initiated in SSA involve either directly or indirectly significant shifts in the distribution of income within a country. These shifts in income represent important barriers to policy reform. For example, over-valued domestic currency are often maintained as a way of keeping the cost of living low to urban consumers. An overvalued currency is a form of export tax--keeping the price of export commodities lower than they would otherwise be. It also acts as an implicit import subsidy--keeping either the domestic cost of imports or the price of import-competing commodities lower than they would otherwise be. Either or both of these latter commodities may be important wage goods. With no change in nominal wages, the consequence of a devaluation would be a decline in real wages. More generally, a rise in food prices results in a regressive shift in the distribution of income against the low income groups.

106. There are also "secondary" income distribution effects resulting from policy reform. If the wage sector is largely privatized, real and/or nominal wages may be forced upon employers. Nonfarm employment will likely decline, and the nonfarm sectors will become unprofitable, thus taking away the impetus for growth. If the major employer of off-farm labor is the public sector, a rise in nominal wages for that sector can have negative budget implications, leading to increased budget deficits, the need to enhance revenue and possibly inflationary financing.

107. Dealing with these problems requires careful analysis of the situation as it is expected to evolve and the development of creative means for dealing with it. In those cases where policy reform brings about a significant shift in income distribution, either between sectors or within agriculture itself, the income gain one group receives can be used as an opportunity to phase out other subsidies. For example, a rise in commodity prices may allow for the elimination of credit and/or input subsidies.

108. There are number of important implications arising from the discussion. First is the need to identify the primary and secondary income effects of policy reform and to assess their political feasibility. Second is the need to be creative in the process of reform so that offsetting shifts in income can be introduced. Third, careful attention should be given to the institutional reforms that will constitute the basis of the policy reform. Finally, the means must be found to deal with the income distribution effects if they pose a barrier to policy reform.

109. Perhaps the most important compensatory measure for rationalizing food prices is the provision of food to disadvantaged groups. The US Food Stamp Program, for instance, has made it possible to maintain food prices at a level higher than would otherwise be obtained in the absence of a commodity program. Other institutional arrangements such as fair price shops in poor areas, direct welfare payments, etc. may also provide insights into ways to implement successfully pricing reforms. The main point is the need to consider the food problems of the disadvantaged groups if there is to be any hope of liberalizing food prices in most countries. Obviously, some policy reforms such as exchange rate realignment go much beyond the agricultural sector. Here, again, the key task is to identify which sector impedes the policy reform and to design measures to reduce or remove those constraints.

110. Feeding programs for the poor point to the need for fiscal resources to support such programs, which in turn suggests the need for changes in the fiscal system. It should be noted, however, that the implicit taxation inherent in overvalued exchange rates, explicit barriers to exports, and marketing boards are a logical response to the lack of adequate fiscal systems in most SSA countries. In some cases, implicit income transfers are achieved through distortions in prices. In other cases, resources are confiscated directly either by means of explicit taxes, excise taxes or marketing boards that pay producers only a proportion of what the commodity earns in the market. In either case, policy reforms are unlikely to be forthcoming unless alternative fiscal means are introduced.

111. A possible alternative fiscal measure would be the implementation of a land tax. A well-designed land tax will have a minimal effect of the reallocation of resources. However, a land tax is politically and administratively difficult to implement. Most countries in SSA have some form of income tax, although agriculture is notorious for not complying with such measures. That is one reason, of course, why the sector ends up being taxed by implicit means. While there may be other means of accomplishing the same result, the important point here is the need for governments to design and implement alternative tax or fiscal systems and to make such systems an integral component of the reform package. Moreover, international donor agencies have an important role to play in supporting the introduction of alternative fiscal systems.

Long-Term Institutional Requirements in SSA

112. While the recent shift among international aid agencies, particularly the World Bank, toward policy-based lending is a necessary condition for revitalizing a stagnant rural economy, policy changes alone are insufficient to sustain agricultural growth over the medium to long-term. Without doubt, policy changes in some parts of Africa would result in immediate increases in food production, particularly where market and price policies provide strong disincentives to producers compared to what would obtain in the absence of these policies. However, without improvements in agricultural technology and related agricultural support systems, the short-run production response to increased producer incentive will not be sustained over the long-term.

113. The view that sustained increases in agricultural production will result from improved producer incentive policies alone is flawed for a number of reasons. First, implementation of producer-oriented agricultural policies in Africa has traditionally been poor. Given the past prevailing bias against agriculture in public policy, there is no compelling reason to expect future experience to be very different. Second, the technology needed to sustain policy-induced agricultural growth, and the associated rural institutions, do not adequately exist. Both technological change and recommendations for supportive institutional reforms must be generated to ensure continuity, constituency and relevance of the results stemming from improved incentive policies.

114. The success of the theory of induced-technical change throughout history supports the need to consider more carefully the contribution of institutional change to economic growth in general and the role of institutional innovation and design in African agriculture in particular. Institutional change is a fundamental part of technological change, both in terms of facilitating the process of technological change itself, as well as diffusing the benefits of technology to the individual farmer. Changes in relative resource endowments (primarily land and labor) give rise to changes in technology. At the same time, however, technical innovation requires changes in institutions.

115. The sources of demand for institutional change are similar to those for technological change. Work by Ruttan and others has shown that a rise in the value of land (due, for instance, to a closing of the land

frontier) in relation to the price of labor induces technical change designed to release the constraints on production that result from an inelastic supply of land and, at the same time, induces institutional changes that lead to greater precision in the definition and allocation of property rights in land. A rise in the price of labor relative to the value of land (due, for instance, to an out-migration of agricultural labor) induces technical changes designed to permit the substitution of capital for labor and, at the same time, induces institutional changes designed to enhance the productivity of labor and improve labor's control over the conditions of employment.

116. While changes in relative resource endowments force changes in both technology and institutions, institutional reforms are also required to strengthen and sustain induced-technical innovation. The technological transformation from a labor extensive farming system to a labor and land intensive system places increasing demands on rural institutions and requires changes in supportive agricultural services. Primary among these rural institutions necessary to facilitate and sustain technical innovation are research and extension, credit, input delivery and output marketing. It should also be recognized that efforts directed solely at agricultural institutions without a corresponding investment in education and health services will not have the desired impact.

117. Two points are worth further stressing. First is the need to be clear about what can be expected from policy reform. The important point is that moving from an inefficient allocation of resources to an efficient allocation is a once-and-for-all gain. These are "cheap" sources of output growth, but once they are obtained the economy is essentially on its old trajectory again. It is not likely that the rapid surge of growth associated with policy reform can be continued in the future. However, once incentives are restored as a consequence of policy reform, it can be expected that investment rates will be higher than they have been in the past. A higher level of investment can change the trajectory of the economy, and thus result in a higher growth rate in the future.

118. The second major point is that, while reforms in price, trade and exchange rate policies are essential to revitalizing economic growth, they must be supported by measures to promote the development of new technologies and associated rural institutions appropriate to the requirements of intensive farming systems. New production technology is a cheap source of new income streams in its own right -- illustrated by the high social rates of return these investments yield. But new production technology also raises the rate of return on investments in more conventional forms of capital as well. In fact, it may be as important in raising investment rates as "getting the prices right."

(b) Role of the Private Sector

119. A wealth of experience in many countries demonstrates that reliance on markets and prices to allocate most types of goods and services leads to a more efficient outcome than the use of government regulations carried out by public agencies.

120. Because of the serious problems in SSA that have resulted from an imbalance between public sector responsibilities and resources available to carry out these responsibilities, it is of great importance that the decisions about the role and the limits of government actions and of price and market mechanisms be based on reasoned judgement. In the areas of education, research, rural infrastructure and health the public sector is crucial. These are public goods and investments in these activities would be far below the socially optimal level obtained if they were left in private hands. But in the realm of economic activity, in terms of agricultural goods, the great advantage of the family, private firms and farmer co-operatives generally is that they are able to respond directly to price and market signals and have little need of hierarchical techniques of calculation and control. Farm level decision-making can be performed with impressive efficiency even if the individuals concerned have never received formal education in bureaucratic or management skills.

121. In carrying out widely-dispersed marketing of farm products and distribution of inputs, it is of great importance that private firms are able to exhibit greater flexibility which leads to greater efficiency.

This follows from the fact that they are directly controlled by the price system, by profit incentives and by competitive pressures so that there is an incentive to reduce costs and improve performance. This is in marked contrast with government agencies or parastatals which are subject to fundamental difficulties in carrying out essential commercial activities efficiently. Such agencies rely on hierarchial levels of management and techniques of calculation and control including the bureaucratic regulations intended to limit graft and corruption. The dismal performance of food marketing boards influenced by these problems has been a major factor adversely affecting the progress of small farmers and potential for increasing productivity in the last twenty years.

122. An uncritical commitment to the private sector and the establishment of farmer co-operatives can, however, be as counter-productive as an instinctive preference for government agencies. There are occasions when a parastatal can play an important role in promoting efficient marketing and distribution of inputs. A strong case can be made for such a role during a transitional period from the introduction of a new crop with accompanying inputs, to such a point where the level of demand for these inputs is sufficient to attract competing firms and independent co-operatives. Parastatals can then perform useful roles facilitating and developing marketing efficiency and the development of a service of market information. The Kenya Tea Development Authority is a notable example of a parastatal that has carried out these roles excellently. Its role was especially important because it facilitates smallholder tea production by handling the functions of coordination and processing that are characterized by genuine economies of scale.

VI. FARM/NON-FARM LINKAGES

123. Based on experience in Asia, emphasis on small farm agriculture as a centerpiece of development attention may not only produce accelerated growth in agriculture itself but can be expected to generate faster growth in the rural economy as a whole through the action of linkage multipliers.

124. For the purpose of reviewing these linkages it is necessary first to define what is meant by non-farm activities. They are taken to be all economic activity apart from crop and livestock production. Thus, non-farm activities encompass services, commerce and manufacturing, including agro-industries which process, package or distribute agricultural commodities. The extent of rural non-farm enterprises varies enormously in different countries of SSA ranging from three percent of the labor force engaged in such enterprises to as high as forty-one percent in some countries. Care has to be taken in interpreting these figures and the differences. One of the major causes of confusion in such estimates is the different perception of the female work force in different countries. Thus Benin's forty-one percent share of non-farm activities in rural employment is affected by the classification in Benin of most active women as being employed outside of agriculture. Chad, a muslim society, represents the opposite extreme. In the classification used there women appear to participate in little but agriculture. These definitional and classification problems notwithstanding it is clear that non-farm activities are an important part of the rural economy and employ a significant minority share of the rural labor force.

125. What are the characteristics of rural non-farm enterprises? The first and most important is that the overwhelming majority of such enterprises are extremely small. In fact, most employ less than ten workers and the average is rarely more than two, that is the owner plus one additional worker. Larger firms operating in rural areas appear limited to distributors or wholesalers of rural commodities or locally based manufacturers. Such manufacturers generally confine their operations to weight-losing production processes such as lumbering, sugar production, oil extraction or the preliminary processing of perishable commodities such as tea, cocoa or coffee.

126. The second characteristic of rural non-farm enterprises is that they require very modest amounts of capital. Average capital per enterprise commonly ranges between \$500 and \$4000 dollars in African rural nonfarm activities. But requirements vary considerably among activities. High capital demanding activities such as grain milling, saw mills wholesaling and gasoline stations demand investments in the range of ten thousand dollars per enterprise; while pottery, leatherwork, weaving, small-scale trading and repairs require on the order of \$50 to \$600.

127. Thirdly, rural non-farm enterprises experience marked seasonal fluctuations in activities. They typically achieve peak activity in the dry season immediately after harvest when both labor inputs and cash demands for non-farm products are most freely available in the rural economy.

128. The composition of non-farming enterprises is difficult to assess due to the paucity of reliable data. Amid wide variation, available data indicate that commercial establishments typically predominate, employing 30% to 40% of the rural nonfarm workforce services and manufacturing comprise about 25% each, with construction and mining accounting for the remainder.

129. There are five structural linkages that exist between agriculture and non-farm activities. There are two types of resource flows, capital and labor, between farm and non-farm enterprises. An agricultural surplus may finance a sewing machine or a small food stand. Conversely tailoring or beer brewing may finance a draft oxen or a plow. Similarly, labor is directed from one activity to another by order of the household head. Third and fourth are the forward and backward production linkages which flow between rural farm and non-farm enterprises. Backward linkages from agriculture covers the supply by rural non-farming enterprises of tools, pumps and other production inputs required by agriculture. The forward linkages from agriculture include a host of processing and distribution services supported by increased agricultural output. Prominent among SSA agro-industries are grain milling, beer brewing, palm, peanut and oil extraction, coffee and cocoa dehulling and drying, and a distribution and packaging of a full range of agricultural commodities. The fifth linkage between farm and non-farm activities is the consumer demand linkage. Although demand runs both ways, most models of the rural economy emphasize agricultural income increases which generate second-round consumer demand for non-farm consumer goods such as clothing, prepared foods and beverages,

building services and furniture. The key empirical question here concerns the income elasticity of demand for rurally produced non-farm goods and services. In terms of assessing the overall growth of the rural economy, the question to be answered is what is the total magnitude of these linkages?

130. A recent study draws the conclusion that rural non-farm production in Africa has been growing more rapidly than employment in agriculture and, therefore, that the share of non-farm activities in total rural employment has been growing. Other data seem to point to the fact that service, commerce and restaurants are the fastest growing non-farm sectors, and that these are of greater significance than manufacturing and construction. Recent farm management studies confirm that African agricultural households allocate a significant part of their household labor to remunerative non-farm activities.

131. Backward linkages from agriculture to rural input suppliers do exist in SSA. Blacksmithing is one activity that reaches its peak during the height of the agricultural season because of the demand for repair services. But in general, compared to Asia, the backward linkages in SSA are weak. This is related to the current stage of the involvement of farming systems. Currently the use of inputs is low and the use of animal traction and farm implements is far less prevalent in SSA than in Asia. Even though these backward linkages are weak today, if the other measures discussed earlier to facilitate accelerated agricultural development are undertaken, it may be expected that these linkage multipliers will grow.

Nevertheless, they are likely to remain lower than in Asia. Because, first, the requirement for irrigation equipment and construction will be small and, second, lower population densities mean that implement suppliers require a larger geographic area to support a minimum scale of operation. This leaves them more vulnerable to competition from high volume urban suppliers.

132. The forward linkages from agriculture to processors and distributors are currently far larger than the backward linkages. Available data shows them to be at least ten times greater than the backward linkages. Food processing is one of the most important, with beer brewing as the largest single non-farm activity in many countries. Milling is also considered important, but, overall, distribution of agricultural products is the largest of the non-farm linkages. Retailing is a very labor intensive activity and accounts for a great majority of employment in West Africa.

133. In a situation where farm incomes are increasing, the consumer linkages derived from these increases have the potential to be an important stimulant to the growth of the rural non-farm economy. As per capita incomes rise, the demand for higher quality foods and local services typically increases more rapidly than that for food grains. The Asian experience suggests that the production of these commodities is labor intensive, hence rural employment increases quite rapidly with per capita farm income increases. Evidence in Africa is scanty. But available data suggest that because this linkage depends on a combination of high

population density and adequate transport facilities, it may be less applicable to large parts of SSA today. It may be hypothesized that, in the absence of relatively cheap labor, goods and services in rural areas, as per capita incomes increase demand will shift more rapidly from food grains to urban manufactured goods in SSA than in Asia, failing to stimulate the rural non-farm economy by this fast transition.

134. When all the scanty data from Africa are assessed, what can be said about the overall size of the linkage multiplier between the farm and non-farm economies? An estimate produced for this study is that the multiplier is currently about 1.5. This compares to a figure of 1.83 reported in two Asian studies. In which case it may be said that the indirect gains in non-tradeable value added are only sixty percent as large in SSA as in Asia. These indicative multipliers depend critically on the assumption of the highly elastic supply of non-tradeables. If this is less elastic, perhaps because of labor shortages in SSA, then the multiplier will necessarily be smaller.

135. Some tentative policy implications may be drawn which together point to some clear directions for action that is required to balance rural growth and maximize rural farm spin-off of agricultural development. First policies clearly matter. Macro-policies have taxed agriculture for generations, diminishing rural incomes, and hence consumption multipliers. Investment codes have regularly treated large firms more generously than small, conferring substantial competitive advantages on the large farm producers through tariff relief, subsidized credit and access to foreign exchange at overvalued rates.

136. Second, the historical focus of both policy makers and researchers on manufacturing seems misplaced. The spatial, time series and consumption data uniformly point to commerce and services as the key growth sectors over the course of the coming rural structural transformation. Some manufacturing activities will grow, particularly tailoring, carpentry and metal work. But the exclusion of services and commerce from many promotional schemes on the grounds that they are unproductive is unfortunate. Services in particular are the best insulated from competition from urban areas. Service and commercial enterprises require credit, management and technical assistance, as well as access to key infrastructure if they are to attract the clientele commensurate with their potential.

137. Third, rural towns may act as a focal point for the development of the rural non-farm economy. For them to play their role in a balanced rural development process it will be essential for them to be assured of adequate economic and social infrastructure to support emerging modern non-farming activities. Electricity, telegraph and telephone communications, water and roads will all be important. Fourth, and closely related to the above, key institutional infrastructure will be essential in fostering the transition to a more specialized productive rural economy. Rural financial markets will be of particular importance in this context.

138. Fifth, women will likely play an important role in the emerging rural non-farm economy. Many of the non-farm activities that will grow most rapidly (e.g. food processing, tailoring, marketing and certain service activities) are female dominated. So too are many of the declining rural non-farm occupations (e.g. basket-making, that mat-making, ceramics and weaving). Consequently, women will be key actors in the economic transition of Africa's rural economy. In order to facilitate women's contribution to accelerated rural transformation there is a need to review key regulations (e.g. a regulation in many countries which prohibit married women from holding their own bank accounts).

VII. INTERNAL MIGRATION^{7/}

139. Low-density population areas of good agro-climatic potential can grow rapidly if interventions concentrate on providing the basic infrastructure required, and if land rights are sufficiently flexible to allow for immigration. Populations in low-density areas can benefit substantially from immigration because it reduces the per capita cost of infrastructure and government services, allows for farming systems to evolve more rapidly, and enables the local population to benefit from a

^{7/} An important aspect of integrating rural economies, i.e. regional trade is not discussed in this paper. A separate paper on this topic is commissioned by the Special Office on African Affairs.

more diversified local economy. But there are equally vast regions where agricultural resources are uniformly poor. If agricultural investments do not have a sufficiently high rate of return to enable a poor region to compete effectively in national or international markets characterized by depressed commodity prices, undertaking such investments will not benefit such a poor region. If investments are provided on a subsidized or a grant basis, they may simply be a disguised income transfer. In such instances, it is often more cost-effective to invest in nonagricultural development or to provide income transfer in some other form. But in this case, rapidly growing populations of resource poor regions must be given opportunities to migrate to lower density areas, as labor data indicate that not all people can be provided with employment in urban areas. To forego these benefits for political reasons is as erroneous as foregoing gains from trade. The task is to find ways to mitigate the political problems and to protect both immigrant and resident populations from adverse effects, not to stop migration or to fail to encourage it.

140. However, such movements must be planned and controlled to achieve stability. In some instances, years of good extension work result in local prosperity, only to be lost in one season by a wave of immigrants and their livestock. In addition, uncontrolled immigration and settlement on steep land and poor soils may offer certain disaster in a few years.

141. Agricultural systems can adapt successfully to very high population densities. Nevertheless, the long-term prospects for rural populations can be improved by reducing the rate of population growth.

While selected low-density areas can gain from higher population levels, it is better for such growth to occur via immigration than via high levels of fertility. Where densities are already high, further rapid population growth carries high risks of preventing social improvement. This is because achieving rapid agricultural growth requires that many changes have to occur simultaneously. There must be rapid changes in technology and high levels of investment in land and infrastructure. Institutions providing research extension and credit must be developed, and the rules governing land rights must be changed. To get all these changes to occur simultaneously is a major challenge for governments, even if they entrust many tasks to the private sector. The consequences of slow agricultural growth are much more severe when population density is growing at over three percent per annum than when it is growing at a slower pace, so that mistakes and policy errors which slow down agricultural growth can be accommodated and corrected with reduced risks of straining the social fabric.

VIII. CONCLUSION

142. Experience over the past few years demonstrates that the removal of distortions in macroeconomic and sectoral policies is an essential first step in halting the deterioration of African agriculture. This effort has most often involved measures to liberalize trade and remove trade distortions, to mobilize domestic resources, to improve the efficiency of domestic resource use including removing government control over prices, and to divest parastatals of certain marketing activities. While these

measures are required for creating an economic environment in which agricultural development can occur, they are not enough to sustain that development over the long term. In other words, the removal of policy distortions is a necessary, but not a sufficient condition for achieving sustainable agricultural growth.

143. If mounting population and land constraints force the intensification of agricultural production in Africa, policy reforms must be accompanied by measures to promote the development of technologies, institutions and marketing structures appropriate to the requirements of intensive agricultural production systems. This suggests parallel initiatives to facilitate the development of intermediate technologies appropriate to the factor endowments of specific regions, the strengthening of adaptive and applied research capacities at the national level, the creation of land markets, and an improvement in the delivery of inputs and marketing of outputs. These two steps are closely linked, together they offer a viable approach to sustainable agriculture in Africa.

Annex 1

**Stimulating Agricultural Growth and Rural Development in
Sub-Saharan Africa**

List of Background Papers Prepared for the Study

Capacity of the African Environment to Sustain Population Growth;
by H. Charles Pereira.

The Role and Potential of Irrigation in the Agricultural Development of
Sub-Saharan Africa; by Jose Olivares.

Technology, Investment and Institutional Priorities for Rapid Agricultural
Growth in Sub-Saharan Africa; by H. Binswanger and A.J. Pritchard.

Growth and Equity in Agricultural and Rural Development Strategies for
Sub-Saharan Africa, by Bruce F. Johnston and Shelly Sundberg.

Policies and Incentives for Agricultural Production and Investment: Policy
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Farm and Non-Farm Linkages in Rural Sub-Saharan Africa: Empirical Evidence
and Policy Implications; by Steve Haggblade, Peter Hazell and James Brown.

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